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# Release Notes for Cisco IOS Release 11.2(4) Software Feature Packs—Cisco 3600 Series Routers

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## March 31, 1997

These release notes identify the Cisco Internetwork Operating System (Cisco IOS) Release 11.2 feature packs for Cisco 3600 series routers.

Product numbers for the supported features packs are as follows:

- CD36-C-11.2= (Cisco 3600 IP Feature Pack)
- CD36-CP-11.2= (Cisco 3600 IP Plus Feature Pack)
- CD36-B-11.2= (Cisco 3600 IP/IPX/AT/DEC Feature Pack)
- CD36-BP-11.2= (Cisco 3600 IP/IPX/AT/DEC Plus Feature Pack)
- CD36-A-11.2= (Cisco 3600 Enterprise Feature Pack)
- CD36-AP-11.2= (Cisco 3600 Enterprise Plus Feature Pack)

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**Note** The feature packs listed here are supported in Cisco IOS Release 11.2(4). The feature packs contain Router Software Loader Version 4.11.

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These release notes contain the following sections:

- Platforms Supported, page 2
- What is a Feature Pack?, page 2
- Cisco Feature Pack Descriptions, page 2
- Memory Requirements and Upgrades, page 4
- Installation Tips, page 8

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- Alternatives to the Router Software Loader, page 18
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## Platforms Supported

The Cisco Router Software Loader supports the following Cisco 3600 series routers:

- CiscoPro CPA3620 and CPA3640
- Cisco 3620 and Cisco 3640

## What is a Feature Pack?

The heart of a Cisco IOS software feature pack is a CD-ROM that contains software images and the Router Software Loader, a Windows 95 application, which loads the images onto the router. Each Cisco IOS Release 11.2 feature pack CD contains feature sets. For users without Windows 95, images can also be loaded with Windows 3.1 and a TFTP server application.

Each Cisco IOS Release 11.2 software feature pack box contains the following items:

- CD-ROM with the following software:
  - Feature set software images
  - Router Software Loader program (a Windows 95 application)
- Instruction booklet for using the Router Software Loader program
- Release notes (this document), which include instructions for using a TFTP server application and Windows 3.1 as an alternative to Windows 95
- Software license—for using Cisco software in object code form on a single router
- Cisco Documentation CD-ROM, which contains all Cisco IOS software documentation

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**Note** Before running the Router Software Loader, read the section “Installation Tips,” page 8.

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**Note** If you are installing feature sets on a Cisco 3600 series router with no Ethernet or Token Ring interface, use the loading procedures described in the section “Installing the Router Software Using Microsoft Windows 3.1,” page 19.

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## Cisco Feature Pack Descriptions

This section describes the Cisco feature packs, listing the software feature sets comprising each pack. You can use this information to identify your feature pack set in conjunction with the corresponding information provided in the tables in the section “Cisco IOS Release 11.2 and 11.1 Feature Sets,” page 10. Tables in that section identify which features are supported for a feature set on a specific platform.

## Software Feature Packs

Table 1 identifies each feature pack as specified on the label of the CD containing the router software. It also lists the feature sets comprising the feature pack, giving the DOS and UNIX filenames of the images. The table provides a brief description of each feature set and the router platform on which the feature set runs.

**Table 1 Cisco Feature Pack Feature Set Image Filenames**

Feature Sets Included	DOS Filename	UNIX Filename	Description
<b>Cisco 3600 IP Feature Pack Release 11.2 and 11.1 (model number CD36-C-11.2=)</b>			
IP for Cisco IOS 11.2(4)XA	80155204	c3620-i-mz.112-4.xa	IP feature set for Cisco 3620 routers
IP for Cisco IOS 11.2(4)XA	80156004	c3640-i-mz.112-4.xa	IP feature set for Cisco 3640 routers
IP for Cisco IOS 11.1(8)AA	80131008	c3620-i-mz.111-8.aa	IP feature set for Cisco 3620 routers
IP for Cisco IOS 11.1(8)AA	80131908	c3640-i-mz.111-8.aa	IP feature set for Cisco 3640 routers
<b>Cisco 3600 IP Plus Feature Pack Release 11.2 and 11.1 (model number CD36-CP-11.2=)</b>			
IP Plus for Cisco IOS 11.2(4)XA	80155304	c3620-is-mz.112-4.xa	IP Plus feature set for Cisco 3620 routers
IP Plus for Cisco IOS 11.2(4)XA	80156104	c3640-is-mz.112-4.xa	IP Plus feature set for Cisco 3640 routers
IP for Cisco IOS 11.1(8)AA	80131008	c3620-i-mz.111-8.aa	IP feature set for Cisco 3620 routers
IP for Cisco IOS 11.1(8)AA	80131908	c3640-i-mz.111-8.aa	IP feature set for Cisco 3640 routers
<b>Cisco 3600 IP/IPX/AT/DEC Feature Pack Release 11.2 and 11.1 (model number: CD36-B-11.2=)</b>			
IP/IPX/AT/DEC for Cisco IOS 11.2(4)XA	80155004	c3620-d-mz.112-4.xa	IP/IPX/AppleTalk/DECnet feature set for Cisco 3620 routers
IP/IPX/AT/DEC for Cisco IOS 11.2(4)XA	80155804	c3640-d-mz.112-4.xa	IP/IPX/AppleTalk/DECnet feature set for Cisco 3640 routers
Desktop for Cisco IOS 11.1(8)AA	80130808	c3620-d-mz.111-8.aa	Desktop feature set for Cisco 3620 routers
Desktop for Cisco IOS 11.1(8)AA	80131708	c3640-d-mz.111-8.aa	Desktop feature set for Cisco 3640 routers
<b>Cisco 3600 IP/IPX/AT/DEC Plus Feature Pack Release 11.2 and 11.1 (model number CD36-BP-11.2=)</b>			
IP/IPX/AT/DEC Plus for Cisco IOS 11.2(4)XA	80155104	c3620-ds-mz.112-4.xa	IP/IPX/AppleTalk/DECnet Plus feature set for Cisco 3620 routers
IP/IPX/AT/DEC Plus for Cisco IOS 11.2(4)XA	80155904	c3640-ds-mz.112-4.xa	IP/IPX/AppleTalk/DECnet Plus feature set for Cisco 3640 routers
Desktop for Cisco IOS 11.1(8)AA	80130808	c3620-d-mz.111-8.aa	Desktop feature set for Cisco 3620 routers
Desktop for Cisco IOS 11.1(8)AA	80131708	c3640-d-mz.111-8.aa	Desktop feature set for Cisco 3640 routers
<b>Cisco 3600 Enterprise Feature Pack Release 11.2 and 11.1 (model number CD36-A-11.2=)</b>			
Enterprise for Cisco IOS 11.2(4)XA	80155404	c3620-j-mz.112-4.xa	Enterprise feature set for Cisco 3620 routers
Enterprise for Cisco IOS 11.2(4)XA	80156204	c3640-j-mz.112-4.xa	Enterprise feature set for Cisco 3640 routers
Enterprise for Cisco IOS 11.1(8)AA	80131408	c3620-j-mz.111-8.aa	Enterprise feature set for Cisco 3620 routers
Enterprise for Cisco IOS 11.1(8)AA	80132308	c3640-j-mz.111-8.aa	Enterprise feature set for Cisco 3640 routers
<b>Cisco 3600 Enterprise Plus Feature Pack Release 11.2 and 11.1 (model number CD36-AP-11.2=)</b>			

## Memory Requirements and Upgrades

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**Table 1 Cisco Feature Pack Feature Set Image Filenames (Continued)**

Feature Sets Included	DOS Filename	UNIX Filename	Description
Enterprise Plus for Cisco IOS 11.2(4)XA	80155504	c3620-js-mz.112-4.xa	Enterprise Plus feature set for Cisco 3620 routers
Enterprise Plus for Cisco IOS 11.2(4)XA	80156304	c3640-js-mz.112-4.xa	Enterprise Plus feature set for Cisco 3640 routers
Enterprise for Cisco IOS 11.1(8)AA	80131408	c3620-j-mz.111-8.aa	Enterprise feature set for Cisco 3620 routers
Enterprise for Cisco IOS 11.1(8)AA	80132308	c3640-j-mz.111-8.aa	Enterprise feature set for Cisco 3640 routers

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**Note** The Cisco Router Software Loader Version 4.11, contained on every Cisco IOS Release 11.2 and 11.1 software feature pack, supports both Ethernet and Token Ring interfaces.

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## Memory Requirements and Upgrades

Table 2 shows the amounts of both Flash memory and DRAM required by Cisco 3600 series feature sets. Table 3 lists factory default memory and the upgrade options that are available.

**Table 2 Cisco 3600 Series Feature Set Memory Requirements**

Feature Set	Flash Memory	DRAM
IP	4 MB (default)	16 MB (default)
IP Plus	4 MB (default)	16 MB (default)
IP/IPX/AT/DEC	4 MB (default)	16 MB (default)
IP/IPX/AT/DEC Plus	4 MB (default)	24 MB (upgrade) for Cisco IOS 11.2 16 MB (default) for Cisco IOS 11.1
Enterprise	8 MB (upgrade)	24 MB (upgrade)
Enterprise Plus	8 MB (default)	24 MB (upgrade)

**Table 3 Cisco 3600 Series Default Memory and Upgrade Options**

Memory Type	Default	Upgrade Options
Flash memory card	4 MB	8-MB upgrade: MEM3600-8FS=
DRAM <sup>1</sup>	16 MB	Expandable to 64 MB: 4-MB upgrade: MEM3620-4D= 8-MB upgrade: MEM3620-8D= 16-MB upgrade: MEM3620-16D=
DRAM <sup>2</sup>	16 MB	Expandable to 128 MB: 4-MB upgrade: MEM3640-4D= 8-MB upgrade: MEM3640-8D= 16-MB upgrade: MEM3640-16D= 32-MB upgrade: MEM3640-32D=

1. On the Cisco 3620 only.

2. On the Cisco 3640 only.

## Additional Information for Routers with ISDN BRI or ISDN PRI Interfaces

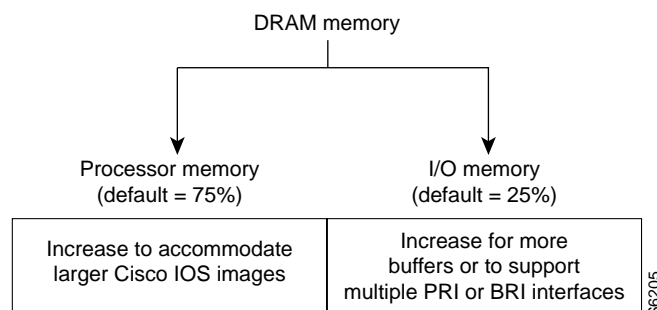
System configurations with multiple ISDN PRI interfaces or 12 or more ISDN BRI interfaces require more I/O memory than the default.

Cisco 3600 series routers ship with a 75/25 I/O memory split. If your router has 2 ISDN PRI interfaces or more than 12 ISDN BRI interfaces, you must change the memory split to 60/40. The following sections provide information about reallocating processor and I/O memory and provide examples of the **memory-size iomem** command. Note that if you do not reallocate memory, you will get an error code.

### Reallocating Processor Memory and I/O Memory

DRAM memory in Cisco 3600 series routers is organized as one contiguous address space divided between processor memory and I/O memory. Depending on the type and number of network interfaces you have configured in the router, you may need to reallocate the DRAM memory partitioned to processor memory and I/O memory.

Cisco manufacturing configures most Cisco 3600 series routers to have 25 percent of the address space allocated to I/O memory and 75 percent allocated to processor memory. But for customers that use two or more ISDN PRI interfaces, DRAM memory must be configured to provide 40 percent of the address space for I/O memory and 60 percent for processor memory. See Figure 1.

**Figure 1 Components and Uses of DRAM Memory for Cisco 3600 Series Routers**

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**Note** Routers running two or more ISDN PRI interfaces or 12 or more ISDN BRI interfaces require a DRAM memory configuration of 60 percent I/O memory and 40 percent processor memory.

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There are cases where you may have to manually reallocate the DRAM memory split between processor memory and I/O memory after you have received a router from Cisco Systems.

For example, suppose your Cisco 3640 router has the following running configuration:

- 2 Ethernet and 2 WAN interface card
- 8-port ISDN BRI with NT1 network module
- IP feature set
- 16 MB DRAM memory (by default, processor memory = 75 percent, I/O memory = 25 percent)
- 4 MB Flash memory

Later on however, you add a 4-port ISDN BRI network module to the router. You now have a total 12 ISDN BRI interfaces running on the router. At this point, you must use the **memory-size iomem** command to configure 40 percent of the address space for I/O memory and 60 percent for processor memory.

To view your current mix of processor and I/O memory and reassign memory distribution accordingly, enter the following commands beginning in privileged EXEC mode:

Task	Command
<b>Step 1</b> View the total amount of memory loaded on the router.	<b>show version</b>
<b>Step 2</b> Determine the amount of free memory.	<b>show memory</b> <sup>1</sup>
<b>Step 3</b> Enter global configuration mode.	<b>configure terminal</b>
<b>Step 4</b> Allocate processor memory and I/O memory.	<b>memory-size iomem</b> <i>I/O-memory-percentage</i> <sup>2</sup>
<b>Step 5</b> Exit global configuration mode.	<b>Ctrl-Z</b>
<b>Step 6</b> Write the new configuration to NVRAM.	<b>copy running-config startup-config</b>
<b>Step 7</b> Reload the router to run the new image.	<b>reload</b>

1. The Free(b) column in the **show memory** command's output shows how much I/O memory is available.

2. The default is 40 percent for I/O memory and (60 percent for processor memory).

Valid I/O memory percentage values are 25, 30, 40 (the default), and 50. I/O memory size is the specified percentage of total memory size, rounded down to the nearest multiple of 1 MB. The remaining memory is processor memory.

The **memory-size iomem** command does not take effect until you save it to NVRAM using the **copy running-config startup-config** EXEC command and reload the router. However, when you enter the command, the software checks whether the new memory distribution leaves enough processor memory for the currently running Cisco IOS image. If not, the following message appears:

Warning: Attempting a memory partition that does not provide enough Processor memory for the current image.If you write memory now, this version of software may not be able to run.

When you enter the **reload** command to run a new image, the software calculates the new processor and I/O memory split. If there is not enough processor memory, it automatically reduces I/O memory to an alternative setting to load the image. If there is still not enough processor memory for the image to run, then you do not have enough DRAM.

See the next section for an example of how to configure the **memory-size iomem** command.

## Reallocate Processor Memory and I/O Memory Examples

The percentage of DRAM allocated to I/O memory and processor memory is configurable.

The following example allocates 40 percent of DRAM to I/O memory and the remaining 60 percent to processor memory:

- Step 1** From EXEC mode, enter the **show memory** command to see whether you need to allocate different percentages of processor and I/O memory. The Free(b) column shows how much I/O memory is available:

```
Router# show memory
      Head  Total(b)  Used(b)  Free(b)  Lowest(b)  Largest(b)
Processor 60913730 3066064  970420  2095644  2090736  2090892
      I/O   C00000  4194304 1382712  2811592  2811592  2805492
--More--
```

- Step 2** Enter global configuration mode and configure the **memory-size iomem** command.

```
Router# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# memory-size iomem 40
Router(config)# Ctrl-Z
Router#
```

- Step 3** Write the new configuration to NVRAM:

```
Router# copy running-config startup-config
Building configuration...
[OK]
```

- Step 4** Enter the **reload** command to run the new image and boot the router from ROM monitor mode:

```
Router# reload

rommon 1 > boot
program load complete, entry point: 0x80008000, size: 0x32ea24
Self decompressing the image :
#####
#####
#####
##### [OK]
```

## memory-size iomem Command

To reallocate the percentage of DRAM memory to use for I/O memory and processor memory on Cisco 3600 series routers, use the **memory-size iomem** global configuration command. The **no** form of this command reverts to the default allocation of 25 percent I/O memory and 75 percent processor memory.

**memory-size iomem** *I/O-memory-percentage*  
**no memory-size iomem** *I/O-memory-percentage*

### Syntax Description

*I/O-memory-percentage*      The percentage of DRAM allocated to I/O memory. The values permitted are **25, 30, 40, and 50** percent.

### Default

The default allocation is 25 percent I/O memory and 75 percent processor memory.

### Command Mode

Global configuration

### Usage Guidelines

This command first appeared in Cisco IOS Release 11.2 P.

Once you specify the percentage of I/O memory in the command line, processor memory automatically takes on the remaining percentage of DRAM memory.

### Example

The following configuration allocates 40 percent of the DRAM memory to I/O memory and the remaining 60 percent to processor memory.

```
Router# configure terminal
Router(config)# memory-size iomem 40
Router(config)# Ctrl-Z
Router# copy running-config startup-config
Building configuration...
[OK]

Router# reload

rommon 1 > boot
program load complete, entry point: 0x80008000, size: 0x32ea24
Self decompressing the image :
#####
#####
##### [OK]
```

## Installation Tips

This section describes several solutions to problems you might encounter when using the Router Software Loader. These solutions are additions to the loader's online help.

### Recovering From a Connection Error

This installation tip provides a possible recovery solution in the event that you are unable to connect to your router. You can skip this section unless you are experiencing a connection error.

In some cases, you might receive the following error message while connecting to the target router:

```
"Failed to configure the router to enable the Cisco IOS software image and configuration file upload and download operations. You may want to check the router to make sure that the selected interface exists."
```



If you encounter this message, try increasing the Short Timeout value in the Options dialog box, especially if one of the following situations applies:

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**Note** Increasing the Short Timeout value may increase the time it takes for the Router Software Loader to connect to the target router.

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- You are connecting to a router that requires the Token Ring interface to be configured. It sometimes takes the Token Ring interface longer to come up than the default Short Timeout value of 15 seconds. Try increasing the Short Timeout to 25 seconds.
- You are connecting to a router that has a large configuration file. Large configuration files can take longer than the default Short Timeout value of 15 seconds to be written to nonvolatile random-access memory (NVRAM).
- You are connecting to a Cisco AS5200. A Cisco AS5200 requires up to 45 seconds to write a configuration to NVRAM, due to the amount of interfaces that must be checked during this process. Increase the Short Timeout value to 50 seconds.

## Preserving the Router's Startup Configuration

As part of the connection procedure, the Router Software Loader writes the current running configuration of the router to the startup configuration in NVRAM. This operation overwrites the previous startup configuration file.



**Caution** If your router is running in ROM monitor mode or from the bootstrap image in ROM, and if the current startup configuration was created while running a full Cisco IOS system image, you should copy the startup configuration file to a network server before running the Router Software Loader. Otherwise, you might lose several configuration commands that are not supported by the bootstrap image, such as all routing and bridging configurations.

As an option, if the router has a valid Cisco IOS image in Flash memory, you can reboot the router from the image in Flash memory before running the Router Software Loader. This way, your configuration commands will not be lost when the Router Software Loader writes the image to NVRAM. To do this, log into the router via the console port using Telnet or terminal emulation software. (If you use terminal emulation software, configure the software settings to 9600 baud, no parity, 8 data bits, and 1 stop bit.) Then follow Step 1 through Step 7 to reboot from Flash memory.

Refer to the following steps to determine the operation mode of your particular router, and then how to reboot the router to run the image in Flash memory:

**Step 1** After logging into the router, observe the command prompt.

If the prompt appears as a “rommon 1>” or “>,” the router is operating in ROM monitor mode.

**Step 2** To boot the router from the image in Flash memory, enter the following command:

```
> b flash
```

The router will now load the Flash memory image. When the image is loaded, you can log out and start the Router Software Loader application.

If the prompt appears as “[router name](boot)>” or “[router name](boot)#,” the router is running the bootstrap image.

- Step 3** Enter the **show version** command at the prompt and examine the Configuration Register value shown in the last line of the **show version** output.
- Step 4** If your router shows the “[router name](boot)>” prompt, enter the **enable** command and supply the password if necessary.
- Step 5** If the last digit of the Configuration Register is greater than 1, enter the **reload** command to reboot the router to run the image in Flash memory.
- Step 6** If the last digit of the Configuration Register is less than 2, you must change the Configuration Register value before reloading, as follows:

```
router# configure terminal
```

- Step 7** Enter the following configuration commands:

```
router(config)# config-register 0x2102
router(config)# Ctrl-Z
router# reload
```

The router will now reboot and load the image in Flash memory. (If you were logged in via Telnet, you will be logged out automatically when the reboot operation begins.)

After the router reboots, you can log out and start the Router Software Loader application.

## Cisco IOS Release 11.2 and 11.1 Feature Sets

This section identifies specific features, within a category of features, supported on Cisco 3600 series routers. You can use the information given in the table provided in this section in conjunction with the information provided in the section “Cisco Feature Pack Descriptions,” page 2, to determine which features a particular feature set supports on a given platform.

Table 4 shows specific features supported for Cisco IOS Release 11.2 feature sets. Table 5 shows features supported for Cisco IOS Release 11.1 feature sets.

The tables use these conventions to identify features:

- Yes: the feature is offered in the basic feature set
- – : the feature is not offered in the feature set
- Plus: the feature is offered only in the Plus feature sets, not in the basic feature set

**Table 4 Cisco IOS Release 11.2 Feature Sets for Cisco 3600 Series Routers**

Features	IP Routing	Desktop (IP/IPX/AppleTalk/DEC)	Enterprise
<b>LAN Support</b>			
Apollo Domain	–	–	Yes
AppleTalk 1 and 2	–	Yes	Yes
Banyan VINES	–	–	Yes
Concurrent routing and bridging	Yes	Yes	Yes
DECnet IV	–	Yes	Yes

**Table 4 Cisco IOS Release 11.2 Feature Sets for Cisco 3600 Series Routers (Continued)**

<b>Features</b>	<b>IP Routing</b>	<b>Desktop (IP/IPX/AppleTalk/DEC)</b>	<b>Enterprise</b>
DECnet V	–	–	Yes
GRE	Yes	Yes	Yes
Integrated routing and bridging (RB)	Yes	Yes	Yes
IP	Yes	Yes	Yes
LAN extension host	Yes	Yes	Yes
Multiring	Yes	Yes	Yes
Novell IPX	–	Yes	Yes
OSI	–	–	Yes
Source-route bridging	–	–	–
Transparent and translational bridging	Yes	Yes	Yes
XNS	–	–	Yes
<b>WAN Services</b>			
Combinet packet protocol	Yes	Yes	Yes
Dialer profiles	Yes	Yes	Yes
Frame Relay	Yes	Yes	Yes
Frame Relay SVC support (DTE)	–	–	Yes
Frame Relay traffic shaping <sup>1</sup>	–	–	–
Half bridge/half router for CPP and PPP	Yes	Yes	Yes
Multichassis Multilink PPP (MMP)	Plus	Plus	Plus
Virtual Private Dial-up Network (VPDN)	–	Yes	Yes
HDLC	Yes	Yes	Yes
IPXWAN 2.0	–	Yes	Yes
ISDN <sup>2</sup>	Yes	Yes	Yes
PPP <sup>3</sup>	Yes	Yes	Yes
SMDS	Yes	Yes	Yes
Switched 56	Yes	Yes	Yes
X.25 <sup>4</sup>	Yes	Yes	Yes
<b>WAN Optimization</b>			
Bandwidth-on-demand	Yes	Yes	Yes
Custom and priority queuing	Yes	Yes	Yes
Dial backup	Yes	Yes	Yes
Dial-on-demand	Yes	Yes	Yes
Header <sup>5</sup> , link, and payload compression <sup>6</sup>	Yes	Yes	Yes
Snapshot routing	Yes	Yes	Yes
Weighted fair queuing	Yes	Yes	Yes

Table 4 Cisco IOS Release 11.2 Feature Sets for Cisco 3600 Series Routers (Continued)

Features	IP Routing	Desktop (IP/IPX/AppleTalk/DEC)	Enterprise
<b>IP Routing</b>			
BGP	Yes	Yes	Yes
BGP4	Yes	Yes	Yes
EGP	Yes	Yes	Yes
Enhanced IGRP	Yes	Yes	Yes
Enhanced IGRP optimizations	Yes	Yes	Yes
ES-IS	–	–	Yes
IGRP	Yes	Yes	Yes
IS-IS	–	–	Yes
Named IP access control list	Yes	Yes	Yes
Network Address Translation (NAT)	Plus	Plus	Plus
NHRP	Yes	Yes	Yes
OSPF	Yes	Yes	Yes
OSPF Not-So-Stubby-Areas (NSSA)	Yes	Yes	Yes
OSPF On Demand Circuit (RFC 1793)	Yes	Yes	Yes
PIM	Yes	Yes	Yes
Policy-based routing	Yes	Yes	Yes
RIP	Yes	Yes	Yes
RIP Version 2	Yes	Yes	Yes
<b>Other Routing</b>			
AURP	–	Yes	Yes
IPX RIP	–	Yes	Yes
NLSP	–	Yes	Yes
RTMP	–	Yes	Yes
SMRP	–	Yes	Yes
S RTP	–	–	Yes
<b>Multimedia and Quality of Service</b>			
Generic traffic shaping	Yes	Yes	Yes
Random Early Detection (RED)	Yes	Yes	Yes
Resource Reservation Protocol (RSVP)	Yes	Yes	Yes
<b>Management</b>			
AutoInstall	Yes	Yes	Yes
Automatic modem configuration <sup>7</sup>	Yes	Yes	Yes
HTTP server	Yes	Yes	Yes
RMON events and alarms <sup>8</sup>	Yes	Yes	Yes
SNMP	Yes	Yes	Yes
Telnet	Yes	Yes	Yes

**Table 4 Cisco IOS Release 11.2 Feature Sets for Cisco 3600 Series Routers (Continued)**

<b>Features</b>	<b>IP Routing</b>	<b>Desktop (IP/IPX/AppleTalk/DEC)</b>	<b>Enterprise</b>
<b>Security</b>			
Access lists	Yes	Yes	Yes
Access security	Yes	Yes	Yes
Extended access lists	Yes	Yes	Yes
Kerberized login	–	–	Yes
Kerberos V client support	–	–	Yes
Lock and key	–	–	Yes
MAC security for hubs	Yes	Yes	Yes
MD5 routing authentication	Yes	Yes	Yes
Network layer encryption (40-bit or export controlled 56-bit DES)	–	–	–
RADIUS	Yes	Yes	Yes
Router authentication	–	–	–
TACACS+	Yes	Yes	Yes
<b>IBM Support (Optional)</b>			
BAN for SNA Frame Relay support	Plus	Plus	Yes
Bisync <sup>9</sup>	Plus	Plus	Yes
Caching and filtering	Plus	Plus	Yes
DLSw+	Plus	Plus	Yes
Downstream PU concentration (DSPU)	Plus	Plus	Yes
Frame Relay SNA Support (RFC 1490)	Plus	Plus	Yes
NetView Native Service Point	Plus	Plus	Yes
QLLC <sup>9</sup>	Plus	Plus	Yes
SDLC integration	Plus	Plus	Yes
SDLC transport (STUN)	Plus	Plus	Yes
SDLC-to-LAN conversion (SDLLC)	Plus	Plus	Yes
SNA and NetBIOS WAN optimization via local acknowledgment	Plus	Plus	Yes
SRB/RSRB	Plus	Plus	Yes
SRT	Plus	Plus	Yes
TG/COS	–	–	Yes
<b>Protocol Translation</b>			
LAT	–	–	Yes
Rlogin	–	–	Yes
<b>Remote Node</b>			
ARAP 1.0/2.0 <sup>10</sup>	–	–	–
Asynchronous master interfaces	Yes	Yes	Yes
ATCP	–	Yes	Yes

**Table 4 Cisco IOS Release 11.2 Feature Sets for Cisco 3600 Series Routers (Continued)**

Features	IP Routing	Desktop (IP/IPX/AppleTalk/DEC)	Enterprise
CPMP	Yes	Yes	Yes
CSLIP	Yes	Yes	Yes
DHCP	Yes	Yes	Yes
IP pooling	Yes	Yes	Yes
IPX on virtual asynch interfaces	–	–	Yes
IPXCP	–	Yes	Yes
MacIP	–	Yes	Yes
NASI <sup>11</sup>	–	Yes	Yes
NetBEUI over PPP	Yes	Yes	Yes
PPP	Yes	Yes	Yes
SLIP	Yes	Yes	Yes
<b>Terminal Services</b>			
LAT <sup>12</sup>	–	–	–
Rlogin	Yes	Yes	Yes
Telnet	Yes	Yes	Yes
TN3270	–	–	Yes
X.25 PAD	Yes	Yes	Yes
Xremote	–	–	Yes

1. Frame Relay traffic shaping will be available in a future 11.2 P release.
2. ISDN support includes calling line identification (ANI), X.25 over the B channel, ISDN subaddressing, and applicable WAN optimization features.
3. PPP includes support for LAN protocols supported by the feature set, address negotiation, PAP and CHAP authentication, and PPP compression. Multilink PPP is available in Cisco IOS Release 11.0(4) and later releases.
4. Includes X.25 switching.
5. IPX header compression (RFC 1553) is available in the feature sets that support IPX in Cisco IOS Release 11.1(1) and later releases.
6. X.25 and Frame Relay payload compression are supported in Cisco IOS Release 11.0(4) and later releases.
7. Automatic modem configuration is available for all features sets in Cisco IOS Release 11.1(2) and later releases. For the Enterprise feature set, automatic modem configuration is available in Cisco IOS 11.1(1) and later releases.
8. The RMON events and alarms groups are supported on all interfaces in Cisco IOS Release 11.1 and later releases. Enhanced RMON feature sets are also available.
9. QLLC and Bisync are available in IP/IBM in Cisco IOS Release 11.0(3) and later releases, and in IP/IPX/IBM and Desktop/IBM base in Cisco IOS Release 11.0(2) and later releases.
10. ARAP will be supported in a future 11.2 P release, not in Release 11.2(4)XA.
11. NASI is supported in Cisco IOS Release 11.1(2) and later releases.
12. Use of LAT requires terminal license (FR-L8-10.X= for an 8-user license of FR-L16-10.X=for a 16 user license)

**Table 5 Cisco IOS Release 11.1 Feature Sets for Cisco 3600 Series Routers**

Features	IP	IP/IPX IBM	IP/IPX/AT	Desktop	Enterprise
<b>LAN Support</b>					
Apollo Domain	–	–	–	–	Yes
AppleTalk 1 and 2	–	–	Yes	Yes	Yes

Table 5 Cisco IOS Release 11.1 Feature Sets for Cisco 3600 Series Routers (Continued)

Features	IP	IP/IPX IBM	IP/IPX/AT	Desktop	Enterprise
Banyan VINES	–	–	–	–	Yes
Concurrent routing and bridging	Yes	Yes	Yes	Yes	Yes
DECnet IV	–	–	–	Yes	Yes
DECnet V	–	–	–	–	Yes
GRE tunneling	Yes	Yes	Yes	Yes	Yes
Integrated routing and bridging (IRB)	–	–	–	–	–
IP	Yes	Yes	Yes	Yes	Yes
LAN extension host	Yes	Yes	Yes	Yes	Yes
Multiring	Yes	Yes	–	Yes	Yes
Novell IPX	–	Yes	Yes	Yes	Yes
OSI	–	–	–	–	Yes
Source-route bridging	Yes	Yes	–	Yes	Yes
Transparent bridging	Yes	Yes	Yes	Yes	Yes
Translational bridging	Yes	Yes	Yes	Yes	Yes
XNS	–	–	–	–	Yes
<b>WAN Services</b>					
Asynchronous	Yes	Yes	Yes	Yes	Yes
Frame Relay	Yes	Yes	Yes	Yes	Yes
HDLC	Yes	Yes	Yes	Yes	Yes
IPXWAN 2.0	–	Yes	Yes	Yes	Yes
ISDN	Yes	Yes	Yes	Yes	Yes
PPP	Yes	Yes	Yes	Yes	Yes
SMDS	Yes	Yes	Yes	Yes	Yes
Switched 56	Yes	Yes	Yes	Yes	Yes
X.25	Yes	Yes	Yes	Yes	Yes
SLIP asynchronous only	Yes	Yes	Yes	Yes	Yes
<b>WAN Optimization</b>					
Bandwidth-on-demand	Yes	Yes	Yes	Yes	Yes
Custom and priority queuing	Yes	Yes	Yes	Yes	Yes
Dial backup	Yes	Yes	Yes	Yes	Yes
Dial-on-demand	Yes	Yes	Yes	Yes	Yes
Header, link and payload compression	Yes	Yes	Yes	Yes	Yes
Snapshot routing	Yes	Yes	Yes	Yes	Yes
Weighted fair queuing	Yes	Yes	Yes	Yes	Yes
IPX and SPX spoofing	–	Yes	Yes	Yes	Yes
<b>IP Routing</b>					
AppleTalk SMRP Multicast	–	–	–	–	–
BGP	Yes	Yes	Yes	Yes	Yes

Table 5 Cisco IOS Release 11.1 Feature Sets for Cisco 3600 Series Routers (Continued)

Features	IP	IP/IPX IBM	IP/IPX/AT	Desktop	Enterprise
EGP	Yes	Yes	Yes	Yes	Yes
Enhanced IGRP	Yes	Yes	Yes	Yes	Yes
OSPF	Yes	Yes	Yes	Yes	Yes
OSPF On Demand Circuit	–	–	–	–	–
IP Multicast (PIM)	Yes	Yes	Yes	Yes	Yes
ES-IS	–	–	–	–	Yes
IGRP	Yes	Yes	Yes	Yes	Yes
IS-IS	–	–	–	–	Yes
Policy-based routing	Yes	Yes	Yes	Yes	Yes
RIP	Yes	Yes	Yes	Yes	Yes
RIP Version 2	Yes	Yes	Yes	Yes	Yes
<b>Other Routing</b>					
AURP	–	–	Yes	Yes	Yes
IPX RIP	–	Yes	Yes	Yes	Yes
NLSP	–	Yes	Yes	Yes	Yes
RTMP	–	–	Yes	Yes	Yes
SMRP	–	–	Yes	Yes	Yes
S RTP	–	–	–	–	Yes
<b>Management</b>					
AutoInstall	Yes	Yes	Yes	Yes	Yes
Automatic modem configuration	Yes	Yes	Yes	Yes	Yes
RMON events and alarms	Yes	Yes	Yes	Yes	Yes
SNMP	Yes	Yes	Yes	Yes	Yes
Telnet	Yes	Yes	Yes	Yes	Yes
<b>Security</b>					
Access lists	Yes	Yes	Yes	Yes	Yes
Access security	Yes	Yes	Yes	Yes	Yes
Extended access lists	Yes	Yes	Yes	Yes	Yes
Kerberized login	–	–	–	–	Yes
Kerberos V client support	–	–	–	–	–
Lock and key	Yes	Yes	Yes	Yes	Yes
MAC security for hubs	–	–	–	–	–
MD5 routing authentication	Yes	Yes	Yes	Yes	Yes
RADIUS	–	–	–	–	Yes
TACACS+	Yes	Yes	Yes	Yes	Yes
<b>IBM Support</b>					
APPN	–	–	–	–	–
BAN for SNA Frame Relay support	–	Yes	–	–	Yes



Table 5 Cisco IOS Release 11.1 Feature Sets for Cisco 3600 Series Routers (Continued)

Features	IP	IP/IPX IBM	IP/IPX/AT	Desktop	Enterprise
Bisync	–	Yes	–	–	Yes
Caching and filtering	–	Yes	–	–	Yes
DLSw+	–	Yes	–	–	Yes
Downstream PU concentration (DSPU)	–	–	–	–	–
Frame Relay SNA Support (RFC 1490)	–	Yes	–	–	Yes
NetView Native Service Point	–	Yes	–	–	Yes
QLLC	–	Yes	–	–	Yes
SDLC integration	–	Yes	–	–	Yes
SDLC transport (STUN)	–	Yes	–	–	Yes
SDLC-to-LAN conversion (SDLLC)	–	Yes	–	–	Yes
SNA and NetBIOS WAN optimization via local acknowledgment	–	Yes	–	–	Yes
SRB/RSRB	–	Yes	–	–	Yes
SRT	–	Yes	–	–	Yes
TG/COS	–	–	–	–	Yes
<b>Protocol Translation</b>					
LAT	–	–	Yes	–	Yes
PPP	–	–	Yes	–	Yes
Rlogin	–	–	Yes	–	Yes
Telnet	–	–	Yes	–	Yes
TN3270	–	–	Yes	–	Yes
X.25	–	–	Yes	–	Yes
<b>Remote Node</b>					
ARAP 1.0/2.0	–	–	–	–	–
Asynchronous master interfaces	Yes	Yes	Yes	Yes	Yes
ATCP	–	–	Yes	Yes	Yes
CPPP	Yes	Yes	Yes	Yes	Yes
CSLIP	Yes	Yes	Yes	Yes	Yes
DHCP	Yes	Yes	Yes	Yes	Yes
IP pooling	Yes	Yes	Yes	Yes	Yes
IPX and ARAP on virtual asynch interfaces	–	–	–	–	–
IPXCP	–	Yes	Yes	Yes	Yes
MacIP	–	–	Yes	Yes	Yes
NASI	–	Yes	Yes	Yes	Yes
NetBEUI over PPP	Yes	Yes	Yes	Yes	Yes
PPP	Yes	Yes	Yes	Yes	Yes
SLIP	Yes	Yes	Yes	Yes	Yes
<b>Terminal Services</b>					
LAT	–	–	Yes	–	Yes

**Table 5 Cisco IOS Release 11.1 Feature Sets for Cisco 3600 Series Routers (Continued)**

Features	IP	IP/IPX IBM	IP/IPX/AT	Desktop	Enterprise
Rlogin	Yes	Yes	Yes	Yes	Yes
Telnet	Yes	Yes	Yes	Yes	Yes
TN3270	–	–	Yes	–	Yes
X.25 PAD	Yes	Yes	Yes	Yes	Yes
Xremote	–	–	Yes	–	Yes

## Alternatives to the Router Software Loader

The Router Software Loader application contained on the feature set CD is designed to work with a PC running Microsoft Windows 95. The booklet included with the CD explains how to perform this simple process. However, two alternatives are available to download software in systems that do not use Windows 95:

- Use the console or auxiliary port
- Use Microsoft Windows 3.1 and a TFTP server application

### Installing the Router Software Using the Console or Auxiliary Port

This type of installation uses the **copy xmodem flash** command.

---

**Note** The transfer takes place only on the port at which you issue the command. If you download via the console, all console output will be discarded for the duration of the transfer. You can only download files to the router; you cannot copy files from the router. Cisco recommends using the auxiliary port for this type of software download. The auxiliary port has hardware flow control and full modem control. In addition, the transfer will not occupy the system console.

---

The following example shows how to use the **copy xmodem flash** command on a Cisco 3600 series router.

```
Router#copy xmodem flash
                                     **** WARNING ****
x/ymodem is a slow transfer protocol limited to the current speed
settings of the auxiliary/console ports. The use of the auxiliary
port for this download is strongly recommended.
During the course of the download no exec input/output will be
available.
                                     ---- *----- ----
Proceed? [confirm]y
Use crc block checksumming? [confirm]y
Max Retry Count [10]:
Perform image validation checks? [confirm]y
Xmodem download using crc checksumming with image validation
Continue? [confirm]y
Partition  Size  Used    Free    Bank-Size  State      Copy Mode
    1       4096K  3259K   836K    4096K      Read/Write Direct
    2       4096K    0K    4095K   4096K      Read/Write Direct
```

```
[Type ?<no> for partition directory; ? for full directory; q to abort]
Which partition? [default = 1] 2

System flash directory, partition 2:
File Length Name/status
 1 68 TESTFILE
[132 bytes used, 4194172 available, 4194304 total]
Destination file name? c3620-i-mz.0918
Erase flash device before writing? [confirm]y
Flash contains files. Are you sure you want to erase? [confirm]y

Copy '' from server
  as 'c3620-i-mz.0918' into Flash WITH erase? [yes/no]yes
Erasing device... eeeeeeeeeeeeeeeeeee ...erased
Ready to receive file.....C
Verifying checksum... OK (0x5DE8)
Flash device copy took 00:12:06 [hh:mm:ss]
```

### Installing the Router Software Using Microsoft Windows 3.1

The Router Software Loader contained on the feature set CD is designed to work with a PC running Microsoft Windows 95. The booklet included with the CD explains how to perform this simple process. However, to download software using a system running Microsoft Windows 3.1 you need to follow the steps in this section.

---

**Note** You must use these procedures to load any software feature set onto a router that contains no Ethernet or Token Ring interfaces.

---

This section describes an alternative method you can use to install the router software from the CD-ROM onto the router using a PC running Microsoft Windows 3.1. The process requires that you first obtain a Trivial File Transfer Protocol (TFTP) application or a remote copy protocol (rcp) application, which you can use to set up your PC as a TFTP server or an rcp server. You can use either the **copy tftp flash** or **copy rcp flash** command to download the router software to the router from a PC running Microsoft Windows 3.1.

---

**Note** If you do not already have a TFTP or rcp application, you can choose from a number of TFTP server applications or rcp applications available from independent software vendors. In addition, a number of TFTP programs are available as shareware from public sources on the World Wide Web.

---

#### Installation Process

This section describes how to install the router software using a Microsoft Windows 3.1 PC with a TFTP server application.

To install the software using an rcp application, follow the same procedure and substitute rcp for TFTP in the instructions. You must also substitute the **copy rcp flash** command for the **copy tftp flash** command.

- Step 1** Install any TFTP server application on the PC. (Not provided by Cisco.)
- Step 2** Launch the TFTP server application on the PC. You commonly do this by double-clicking the application icon or its filename.

**Step 3** Set up the PC as a TFTP server using the TFTP server application setup or configuration facility.

The user interface of most TFTP server applications includes a setup facility that allows you to specify the PC as a server. For example, from the TFTP menu of one application, you can select **Settings** to display a panel that includes a checkbox beside the word Server. To configure the local PC as a server, click in this checkbox.



**Caution** Be sure you set up your local PC as a TFTP server. If you overlook this step, you will not be able to perform the copy procedure. This reminder also applies if you are using rcp on your system instead of TFTP.

**Step 4** Establish a console session from your local PC (which is now configured as a TFTP server), to the Cisco router.

You can do this in two ways:

- Connect the PC's COM port to the router's console port.

This is the recommended method. If you use this method, when you reload the router with the new image in Step 11, you will remain connected to the router. (If you use Telnet, you will lose connection to the router.)

- Establish a Telnet session from the PC to the router.

**Step 5** Connect your PC's Ethernet port to the router's Ethernet port using the 10BaseT crossover cable provided.

---

**Note** Use straight-through cables if you are connecting via a 10BaseT hub.

---

**Step 6** From the console, enter the **copy tftp flash** command.

**Step 7** When prompted, enter the PC's IP address.

**Step 8** When prompted, enter the full pathname of the Cisco IOS Release 11.2 image to be copied to the router as in the following example:

```
Source file name? d:\cpswinst\images\80155204.bin
```

This example specifies the IP feature set for Cisco 3620 routers.

**Step 9** In response to the prompt, enter the destination filename and press **Enter** to indicate that you want to copy the image.

This is the name you select for the image file on the router, not the full pathname of the image on the CD-ROM attached to the PC. In this example, the UNIX filename is used:

```
Destination file name [d:\cpswinst\images\80155204.bin]? c3620-i-mz.112-4.xa
```

During the transfer process, the software displays messages indicating that it has accessed the file you have specified and is loading it.

**Step 10** Enter **yes** or **no** in response to the prompt asking if you want to erase the existing image copy resident in the router's Flash memory before copying the new one:

```
Erase flash device before writing? [confirm] yes
```

When copying to internal Flash memory, the system provides an option to erase existing internal Flash memory before writing onto it. The entire copying process takes several minutes and differs from network to network.

The exclamation point (!) indicates that the copy process is taking place. Each exclamation point (!) indicates that ten packets have been transferred successfully. A series of “V” characters indicates that a checksum verification of the image is occurring after the image is written to Flash memory.

**Step 11** Enter the **reload** command to reload the router:

```
# reload
```

### Command Reference Pages for TFTP and rcp

This section includes reference pages providing detailed information about the **copy rcp flash** and **copy tftp flash** commands. This information supplements the information provided in the steps described earlier in the section “Installing the Router Software Using Microsoft Windows 3.1,” page 19.

### copy rcp flash

To copy a file from a network server to the router or to another destination using rcp, use the **copy rcp flash** EXEC command.

**copy rcp flash**

### Syntax Description

**flash** Specifies internal Flash memory as the destination of the copy operation.

### Command Mode

EXEC

### Usage Guidelines

The rcp protocol requires that a client send the remote username of an rcp request to the server. When you issue the **copy rcp flash** command, by default the Cisco IOS software sends the username associated with the current teletype (TTY), if that name is valid. For example, if the user is connected to the router through Telnet and the user was authenticated through the **username** command, then the software sends that username as the remote username.

---

**Note** For Cisco, TTY lines are commonly used for access services. The concept of TTY originated with UNIX. For UNIX systems, each physical device is represented in the file system. Terminals are called TTY devices, which stands for *teletype*, the original UNIX terminal.

---

If the TTY username is invalid, the software uses the host name as the both the remote and local usernames. To specify a different remote username to be sent to the rcp server, use the **ip rcmd remote-username** command. You can also specify the path of an existing directory along with the remote username.



**Caution** The remote username must be associated with an account on the destination server. If you do not use the **ip rcmd remote-username** command to specify the name of a remote user associated with an account on the server, then the remote username associated with the current TTY process must be associated with an account on the server. If there is no username for the current TTY process, then the host name must be associated with an account on the server. If the network administrator of the destination server did not establish accounts for the remote username used, this command will not execute successfully when a default remote username is used.

If you copy a system image from a personal computer used as a file server, the remote host computer must support the remote shell (rsh) protocol.

Use the **copy rcp flash** to copy a system image from a network server to the router's internal Flash memory using rcp. The Cisco IOS software prompts for the address of the rcp server and rcp filename. When you issue this command, the system provides an option to erase existing Flash memory before writing onto it. The entire copying process takes several minutes and differs from network to network.

Before booting from Flash memory, verify that the checksum of the image in internal Flash memory matches the checksum listed in the README file distributed with the system software image. The checksum of the image in Flash memory is displayed at the bottom of the screen when you issue the **copy rcp flash** command. The README file was copied to the rcp server automatically when you installed the system software image.



**Caution** If the checksum value does not match the value in the README file, do not reboot the router. Reissue the **copy rcp flash** command and compare the checksums again. If the checksum is repeatedly wrong, copy the original system software image back into Flash memory *before* you reboot the router from Flash memory. If you have a corrupted image in Flash memory and try to boot from Flash memory, the router starts the system image contained in ROM (assuming booting from a network server is not configured). If ROM does not contain a fully functional system image, the router cannot function and must be reconfigured through a direct console port connection.

### Examples

The following example shows how to use the **copy rcp flash** command on a Cisco 3600 series router. The interface might differ slightly on other systems. This example copies a system image named file1 from the netadmin1 directory on the remote server named *SERVER1.CISCO.COM* with an IP address of 131.108.101.101 to Flash memory. To ensure that enough Flash memory is available to accommodate the system image to be copied, the Cisco IOS software allows you to erase the contents of Flash memory first.

```
Router1# configure terminal

Router1(config)# rcmd remote-username netadmin1
Router(config)# Ctrl-Z
Router# copy rcp flash

System flash directory, partition 2:
File Length Name/status
```

```

1  984      file1 [deleted]
2  984      file1
[2096 bytes used, 8386512 available, 8388608 total]
Address or name of remote host [255.255.255.255]? 131.108.101.101
Source file name? file1
Destination file name [file1]?
Accessing file 'file1' on 131.108.101.101...
Loading dirt/ssangiah/file1 .from 131.108.101.101 (via Ethernet0): ! [OK]

Erase flash device before writing? [confirm]
Flash contains files. Are you sure you want to erase? [confirm]

Copy 'file1' from server
  as 'file1' into Flash WITH erase? [yes/no] yes
Erasing device... eeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeee ..erased
Loading file1 from 131.108.101.101 (via Ethernet0): !
[OK - 984/8388608 bytes]

Verifying checksum... OK (0x14B3)
Flash copy took 0:00:01 [hh:mm:ss]

```

The following example shows sample output resulting from copying a system image into a partition of Flash memory. The system prompts only if there are two or more read/write partitions or one read-only and one read/write partition and dual Flash memory bank support in boot ROMs. If the partition entered is not valid, the process terminates. You have the option to enter a partition number, a question mark (?) for a directory display of all partitions, or a question mark and a number (?number) for a directory display of a particular partition. The default is the first read/write partition.

```

Router# copy rcp flash

System flash partition information:
Partition  Size    Used    Free    Bank-Size  State      Copy-Mode
1          4096K   2048K   2048K   2048K      Read Only  RXBOOT-FLH
2          4096K   2048K   2048K   2048K      Read/Write Direct

[Type ?<no> for partition directory; ? for full directory; q to abort]
Which partition? [default = 2]

```

If the partition is read-only and has dual Flash memory bank support in boot ROMs, the session continues as follows. Note that the examples show a Cisco 2500 router.

```

          **** NOTICE ****

Flash load helper v1.0
This process will accept the copy options and then terminate
the current system image to use the ROM based image for the copy.
Routing functionality will not be available during that time.
If you are logged in via telnet, this connection will terminate.
Users with console access can see the results of the copy operation.
          ---- ***** ----

Proceed? [confirm]
System flash directory, partition 1:
File Length Name/status
1  3459720 master/igs-bfpx.100-4.3
[3459784 bytes used, 734520 available, 4194304 total]
Address or name of remote host [255.255.255.255]? 131.108.1.1
Source file name? master/igs-bfpx-100.4.3
Destination file name [default = source name]?

```

The file will be copied into the partition given earlier by the user:

```

Loading master/igs-bfpx.100-4.3 from 131.108.1.111: !
Erase flash device before writing? [confirm]
Flash contains files. Are you sure? [confirm]
Copy 'master/igs-bfpx.100-4.3' from TFTP server

```

```
as 'master/igs-bfpx.100-4.3' into Flash WITH erase? [yes/no] yes
```

If the partition is read/write, the session continues as follows:

```
System flash directory, partition 2:  
File Length Name/status  
  1  3459720 master/igs-bfpx.100-4.3  
[3459784 bytes used, 734520 available, 4194304 total]  
Address or name of remote host [255.255.255.255]? 131.108.1.1  
Source file name? master/igs-bfpx.100-4.3  
Destination file name [default = source name]?
```

The file will be copied into the partition given earlier by the user:

```
Accessing file 'master/igs-bfpx.100-4.3' on ABC.CISCO.COM...  
Loading master/igs-bfpx.100-4.3 from 131.108.1.111: !  
Erase flash device before writing? [confirm]  
Flash contains files. Are you sure? [confirm]  
Copy 'master/igs-bfpx.100-4.3' from TFTP server  
as 'master/igs-bfpx.100-4.3' into Flash WITH erase? [yes/no] yes
```

### Related Commands

**boot config**  
**boot system flash**  
**cd**  
**copy flash rcp**  
**ip rcmd remote-username**  
**verify flash**

### copy tftp flash

To copy a file from a TFTP server to the router or to another destination, use the **copy tftp flash EXEC** command.

**copy tftp flash**

### Syntax Description

<b>flash</b>	Specifies internal Flash memory as the destination of the copy operation.
--------------	---

### Command Mode

EXEC

### Usage Guidelines

The system prompts for the address of the TFTP server and TFTP filename if you do not provide them at the command line. When copying to internal Flash memory, the system provides an option to erase existing internal Flash memory before writing onto it. The entire copying process takes several minutes and differs from network to network.



Before booting from Flash memory, verify that the checksum of the image in Flash memory matches the checksum listed in the README file distributed with the system software image. The checksum of the image in Flash memory is displayed at the bottom of the screen when you issue the **copy tftp flash** command. The README file was copied to the TFTP server automatically when you installed the system software image.



**Caution** If the checksum value is not correct according to the value in the README file, do not reboot the router. Issue the **copy tftp flash** command and compare the checksums again. If the checksum is repeatedly wrong, copy the original system software image back into Flash memory *before* you reboot the router from Flash memory. If you have a corrupted image in Flash memory and try to boot from Flash memory, the router starts the system image contained in ROM (assuming booting from a network server is not configured). If ROM does not contain a fully functional system image, the router cannot function and must be reconfigured through a direct console port connection.

### Examples

The following example shows sample output of copying a system image named file1 into Flash memory:

```
Router# copy tftp flash

System flash directory, partition 2:
File Length Name/status
  1   984   file1 [deleted]
  2   984   file1
[2096 bytes used, 8386512 available, 8388608 total]
Address or name of remote host [255.255.255.255]? 223.255.254.254
Source file name? file1
Destination file name [file1]?
Accessing file 'file1' on 223.255.254.254...
Loading dirt/ssangiah/file1 .from 223.255.254.254 (via Ethernet0): - [OK]

Erase flash device before writing? [confirm]
Flash contains files. Are you sure you want to erase? [confirm]

Copy 'file1' from server
  as 'file1' into Flash WITH erase? [yes/no] yes
Erasing device... eeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeee ...erased
Loading file1 from 223.255.254.254 (via Ethernet0): !!!!!...
[OK - 984/8388608 bytes]

Verifying checksum... OK (0x14B3)
Flash copy took 0:00:01 [hh:mm:ss]
```

The exclamation point (!) indicates that the copy process is taking place. Each exclamation point (!) indicates that ten packets have been transferred successfully. A series of “V” characters indicates that a checksum verification of the image is occurring after the image is written to Flash memory.

The following example shows sample output resulting from copying a system image into a partition of Flash memory. The system will prompt only if there are two or more read/write partitions or one read-only and one read/write partition and dual Flash bank support in boot ROMs. If the partition entered is not valid, the process terminates. You can enter a partition number, a question mark (?) for a directory display of all partitions, or a question mark and a number (?*number*) for directory display of a particular partition. The default is the first read/write partition.

```
Router# copy tftp flash

System flash partition information:
Partition Size Used Free Bank-Size State Copy-Mode
```

1	4096K	2048K	2048K	2048K	Read Only	RXBOOT-FLH
2	4096K	2048K	2048K	2048K	Read/Write	Direct

[Type ?<no> for partition directory; ? for full directory; q to abort]  
Which partition? [default = 2]

If the partition is read-only and has dual Flash bank support in boot ROMs, the session continues as follows:

```
**** NOTICE ****
Flash load helper v1.0
This process will accept the copy options and then terminate
the current system image to use the ROM based image for the copy.
Routing functionality will not be available during that time.
If you are logged in via telnet, this connection will terminate.
Users with console access can see the results of the copy operation.
-----
Proceed? [confirm]
System flash directory, partition 1:
File Length Name/status
  1 3459720 master/igs-bfpx.100-4.3
[3459784 bytes used, 734520 available, 4194304 total]
Address or name of remote host [255.255.255.255]? 131.108.1.1
Source file name? master/igs-bfpx-100.4.3
Destination file name [default = source name]?
```

The file will be copied into the partition given earlier by the user:

```
Loading master/igs-bfpx.100-4.3 from 131.108.1.111: !
Erase flash device before writing? [confirm]
Flash contains files. Are you sure? [confirm]
Copy 'master/igs-bfpx.100-4.3' from TFTP server
as 'master/igs-bfpx.100-4.3' into Flash WITH erase? [yes/no] yes
```

If the partition is read/write, the session continues as follows:

```
System flash directory, partition 2:
File Length Name/status
  1 3459720 master/igs-bfpx.100-4.3
[3459784 bytes used, 734520 available, 4194304 total]
Address or name of remote host [255.255.255.255]? 131.108.1.1
Source file name? master/igs-bfpx.100-4.3
Destination file name [default = source name]?
```

The file will be copied into the partition given earlier by the user:

```
Accessing file 'master/igs-bfpx.100-4.3' on ABC.CISCO.COM...
Loading master/igs-bfpx.100-4.3 from 131.108.1.111: !
Erase flash device before writing? [confirm]
Flash contains files. Are you sure? [confirm]
Copy 'master/igs-bfpx.100-4.3' from TFTP server
as 'master/igs-bfpx.100-4.3' into Flash WITH erase? [yes/no] yes
```

### Related Commands

**copy flash tftp**

**verify**

**verify flash**

## Additional Release Note Information

For detailed information about this software release, see the Cisco IOS release notes located on the Documentation CD-ROM. Information that pertains to this feature pack includes the following:

- New features
- Important notes
- Caveats

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**Note** The release notes shipped with your router are designed as reference material. The feature pack release notes (this document) should be sufficient for installing your software.

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## About Cisco IOS Software Electronic Documentation

Cisco IOS software documentation is provided on the Documentation CD-ROM that is included with your feature pack. Documentation about Cisco IOS Release 11.2(4)P and 11.1(8)P describes the software images included on this feature pack CD.

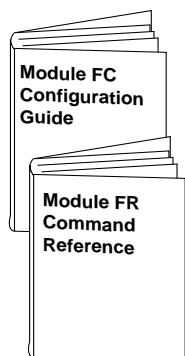
To locate this documentation, you can either use the Documentation CD or go to [www.cisco.com](http://www.cisco.com), select **Products and Ordering, Documentation, Cisco IOS Software Configuration**, and **Cisco IOS Release 11.2**. The documentation for Cisco IOS Release 11.2 is organized as follows:

- Release notes—Use the *Cisco IOS Release 11.2(4)P Release Notes*.
- Feature guides—Use the *Cisco IOS Release 11.2(4)P Feature Guide*.
- Eight modules that comprise the configuration guides and command references, which are described in Figure 2.
- *Cisco IOS Software Command Summary*—Summarizes the commands in the command reference publications. For each command, the summary provides complete syntax, the purpose of the command, and a description of each keyword and argument in the command syntax.
- *System Error Messages*—Describes system error messages reported by Cisco IOS software.
- *Cisco Management Information Base (MIB) User Quick Reference*—Describes the Cisco Systems private, or local, Management Information Base (MIB), which is provided with all Cisco software releases and with CiscoWorks router management software. A MIB file contains variables that can be set or read to provide information on network devices and interfaces. The Cisco MIB is a set of variables that are private extensions to the Internet standard MIB II.
- *Debug Command Reference*—Provides information about using debug commands to troubleshoot your network. The *Debug Command Reference* is intended for network administrators who already know how to configure a router and are familiar with all relevant network equipment.
- *Access Services Quick Configuration Guide*—Describes the tasks you perform to solve common business problems with access service technologies. It presents the most common access service tasks in a format that enables you to configure your access server quickly for the most common tasks. It does not describe every feature, but describes those tasks that you most likely need to do to configure your access server.
- Caveats

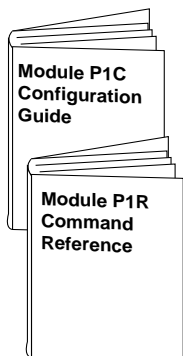
The documentation for Cisco IOS Release 11.1 is organized as follows:

- Release notes—Use the *Release Note and Updates to Cisco IOS Release 11.1 AA*.
- Configuration guides and command references
- Cisco IOS supporting documentation
- Caveats

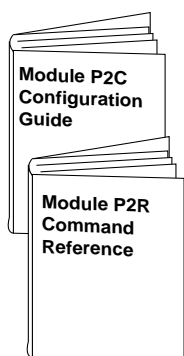
Figure 2 Cisco IOS Configuration Guides and Command References



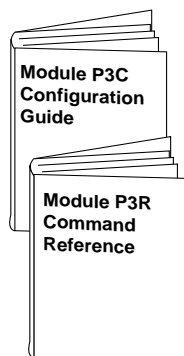
- Module FC/FR:  
Configuration Fundamentals**
- Access Server and Router Product Overview
  - Cisco IOS Software Configuration Basics
  - Images and Configuration Files
  - Interface Configuration
  - System Management



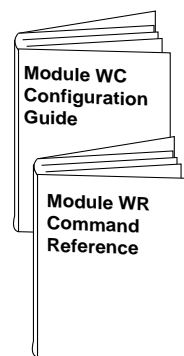
- Module P1C/P1R:  
Network Protocols, Part 1**
- IP Addressing
  - IP Services
  - IP Routing Protocols



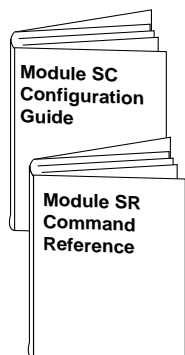
- Module P2C/P2R:  
Network Protocols, Part 2**
- AppleTalk
  - Novell IPX



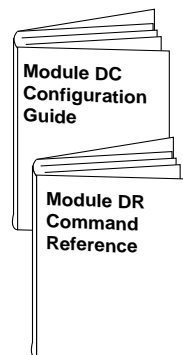
- Module P3C/P3R:  
Network Protocols, Part 3**
- Apollo Domain
  - Banyan VINES
  - DECnet
  - ISO CLNS
  - XNS



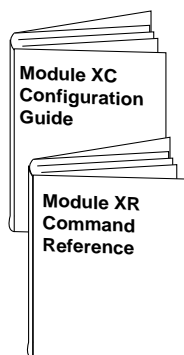
- Module WC/WR:  
Wide-Area Networking**
- ATM
  - Frame Relay
  - SMDS
  - X.25 and LAPB



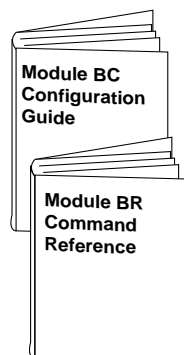
- Module SC/SR:  
Security**
- Terminal Access Security
  - Network Access Security
  - Accounting and Billing
  - Filtering Traffic
  - Preventing Fraudulent Route Updates
  - Network Data Encryption



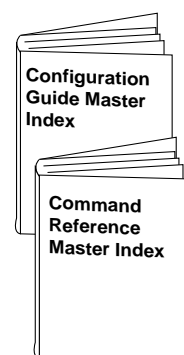
- Module DC/DR:  
Dial Solutions**
- Dial Business Solutions and Examples
  - Dial-In Port Setup
  - DDR and Dial Backup
  - Remote Node and Terminal Service
  - Cost-Control and Large-Scale Dial Solutions
  - VPDN



- Module XC/XR:  
Cisco IOS Switching Services**
- Switching Paths for IP Networks
    - Fast Switching
    - Autonomous Switching
    - NetFlow Switching
    - Optimum Switching
  - Virtual LAN (VLAN) Switching and Routing
    - Inter-Switch Link Protocol Encapsulation
    - IEEE 802.10 Encapsulation
    - LAN Emulation



- Module BC/BR:  
Bridging and IBM Networking**
- Transparent Bridging
  - Source-Route Bridging
  - Remote Source-Route Bridging
  - DLSw+
  - STUN and BSTUN
  - LLC2 and SDLC
  - IBM Network Media Translation
  - DSPU and SNA Service Point
  - SNA Frame Relay Access Support
  - APPN
  - NCIA Client/Server Topologies
  - IBM Channel Attach



- Configuration Guide Master Index**
- Command Reference Master Index**

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Cisco IOS configuration guides describe system configuration and maintenance tasks and provide comprehensive configuration examples. The configuration guides do not include command syntax for every command, so you should use them in conjunction with the command references. The Cisco configuration guides give in-depth descriptions of configuration tasks.

Cisco IOS command references describe the commands necessary for configuring and maintaining your system. If you are new to Cisco software, you should use the Cisco command references in conjunction with the configuration guides to reference commands and detailed information pertaining to their use. If you are an experienced network administrator, you might want to use the Cisco command references as standalone manuals.

## Cisco Connection Online

Cisco Connection Online (CCO) is Cisco Systems' primary, real-time support channel. Maintenance customers and partners can self-register on CCO to obtain additional information and services.

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You can access CCO in the following ways:

- WWW: <http://www.cisco.com>
- WWW: <http://www-europe.cisco.com>
- WWW: <http://www-china.cisco.com>
- Telnet: [cco.cisco.com](http://cco.cisco.com)
- Modem: From North America, 408 526-8070; from Europe, 33 1 64 46 40 82. Use the following terminal settings: VT100 emulation; databits: 8; parity: none; stop bits: 1; and connection rates up to 28.8 kbps.

For a copy of CCO's Frequently Asked Questions (FAQ), contact [cco-help@cisco.com](mailto:cco-help@cisco.com). For additional information, contact [cco-team@cisco.com](mailto:cco-team@cisco.com).

If you are a network administrator and need personal technical assistance with a Cisco product that is under warranty or covered by a maintenance contract, contact Cisco's Technical Assistance Center (TAC) at 800 553-2447, 408 526-7209, or tac@cisco.com. To obtain general information about Cisco Systems, Cisco products, or upgrades, contact 800 553-6387, 408 526-7208, or cs-rep@cisco.com.

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This document is to be used in conjunction with the *Cisco IOS configuration guide* and *command reference* publications.

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